I have long since made up my mind what I shall do if I, in my turn, become the subject of appendicitis—I shall forthwith call in a surgical friend, and if he says "Yes, I think that the appendix is at fault," I shall ask him if he would mind my getting another surgeon (not a physician) to come and see me with him for the purpose of confirmation; and on the diagnosis being confirmed, I shall beg him *at once* to operate. And if these principles were adopted in all cases of appendicitis, would not the mortality of the disease be lowered by more than *90 per cent.*? I think so.

I have not hurriedly formed the opinion that the greatest safety in appendicitis is in the early operation. And certainly I did not start with that opinion: I have been steadily driven to it. I have seen a fair share of cases of appendicitis, with some of which I have been associated from the beginning of the attack; to more I have been called in when the disease had already made considerable headway, and for others my help has been asked only towards the close of the chapter. And my deliberate opinion is that if it were generally recognized that safety lay in prompt operation, the present high death-rate in the disease, as I have already said, would be greatly lowered.

At various times in our professional life we have to study our bearings, take soundings, and re-shape our course. How greatly thus has our treatment of cancer of the breast, for instance, improved in recent years, for even if there is a slight margin of doubt in that diagnosis we now urge immediate and complete operation. There is no waiting for the appearance of signs which shall render the diagnosis so clear that there is no chance of mistaking a chronic inflammatory thickening for a malignant infiltration; the patient and not the tumour is now given the benefit of the doubt, and the improvement in our results has, in consequence, been most remarkable. In diphtheria, too, antitoxin is injected without a moment's delay; and in the case of suspected renal calculus the kidney is explored for a likely stone even if the *x* rays fail to reveal its presence.

Misleading Conditions.

Whether all the views advocated in this paper prove acceptable or not, there is, at any rate, one point which ought to receive a more general recognition: it is the reference to the fact that there may be a comparative absence of clinical signs in the presence of advanced and perilous disease in the appendix. It does not at present seem to be universally realized that the pulse and temperature of a person may be normal in spite of the appendix being gangrenous or perforated; that in some of these stealthy and rapid cases there is absolutely no fullness in the fossa; and that if the chief pathological change in the appendix is gangrene, there need be very little local tenderness—for there is no sensation in dead tissue; that as there is no sensation in a mortified appendix, there need be no reflex rigidity of the abdominal muscles covering the fossa; that there being no excitement of pulse or temperature, and little or no local pain or tenderness, the patient may make light of his trouble and that his aspect may be deceivingly cheerful. Thus, in the most dangerous class of cases of appendicitis there may be but little either to cause anxiety or to attract serious attention. Every operating surgeon will bear one out in this, and will agree that, for the happiness of all concerned, the family doctor should never sit pondering over his case of suspected appendicitis, but should *at once* call in surgical aid. If the surgeon then says that because he is not sure he would rather wait a little, at any rate, whatever happens, the doctor will not afterwards have anything to reproach himself with. But I do not think that there are many surgeons who would counsel delay; we have all seen enough of the danger of waiting.

In no respect, I think, has improvement in surgical treatment in the last quarter of a century been more marked than in that of strangulated hernia. Taxis and the hot bath happily have become things of the past. The general practitioner sends his patient into the hospital without hesitation or delay, or calls in the surgeon for immediate operation: and instead of there being now a high death-rate from strangulated hernia, statistics would show a most remarkable improvement. And what, in my opinion, is wanted at the present time is a similar waking up of the profession with regard to the treatment of appendicitis.

We have heard of the sailor who, when his ship was in action, saw an unexploded shell, with a time fuse attached, land upon the deck. He did not wait to see the development of events, but, taking the shell up in his arms, dropped it over the ship's side out of harm's way. An inflamed appendix is a shell with a lighted time fuse, and though in any case it may happily fail to explode, it is far safer to lift it out at once and drop it overboard.

In the course of this paper scarcely a word has been said as regards alternative methods of treatment, for, in my opinion, *there is no place for the discussion of general measures until after the inflamed appendix is out.*

Whilst waiting for leave to operate, nothing whatever should be given by the mouth, and no fomentation or water-dressing should be used, because wetting the skin spoils the antiseptic effect of the tincture of iodine, which should at once be freely and widely painted over the region in preparation for operation. But there will be plenty of scope for treatment after the appendix has been removed, and especially so in those cases in which the blood or the peritoneum has already been poisoned by absorption.

The discussion at the present time should be directed towards the solution of the important question as to whether immediate operation or temporizing ought to be the rule in the treatment of appendicitis. If the answer is in favour of immediate operation, such subjects as that of the choice of anaesthetic, the routine washing out of the stomach before the patient leaves the table, the administration of opium, or of purgatives, may well be referred to; but the main question should first be settled. And in a meeting such as this the answer will be likely to prove useful towards the drawing up of a Rule for the guidance of the practitioner in the treatment of every case of appendicitis.

THE FUNCTION OF THE APPENDIX AND THE ORIGIN OF APPENDICITIS.

BY

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SURGEON TO THE CHILDREN'S HOSPITAL, GREAT ORMOND STREET, AND TO ST. THOMAS'S HOSPITAL, IN CHARGE OF THE SURGICAL ISOLATION WARDS AND OUT-PATIENTS, ETC.

Shortly after his death, which took place so lately, a paper by Mr. C. B. Keetley was published in the *Annals of Surgery* about the function and value of the appendix. Both he and Sir William Macewen regard the appendix as an actively useful and valuable organ not to be sacrificed lightly. Their opinions are based largely upon clinical, and therefore complicated, observations. Other observers, such as Mr. W. J. Mayo, incline to the other extreme—that the value and function of the appendix is so small that it is absolutely inconsiderable when compared to the dangers which it may cause. When the enormous number of people are considered who have had their appendix removed and are in perfect health, one cannot but sympathize with the latter view put forward. Yet as a matter of scientific interest the appendix has a function; and, when removed, that function is undertaken by neighbouring tissue, and the patient is relieved of a passive tube containing actively poisonous material. This view I advocated in the Erasmus Wilson Lectures delivered before the Royal College of Surgeons in 1904,[1] and, in view of Mr. Keetley's recent death, shall content myself with restating them. This is done in four sections: The natural history of the ileo-caecal region, the physiology of the appendix, the development of the appendix, and the pathology of chronic typhlitis and appendicitis.

The Natural History of the Ileo-caecal Region.

Food in the mouth is reduced by the action of the teeth to a more or less pulpy condition, in which state it enters the stomach, where it is further broken into fragments by the action of the hydrochloric acid, pepsin, and churning muscular movements. The casein of our primitive natural food—milk—is precipitated and also fragmentated. The

pylorus, the smallest portion of the alimentary canal, allows, or should allow, no large pieces to pass into the duodenum. The work of the stomach and mouth may be regarded as chiefly, if not entirely, preparatory to chemical digestion and absorption and to partake of the physical nature of fragmentating the food. The more perfect the work of the stomach the more completely will the food be reduced to a molecular condition, and consequently the more perfectly will it be adapted for the chemical action of the bile and pancreatic secretions. The next twenty odd feet of the small intestine are given over to these chemical changes and the absorption of nutriment. The products of digestion having reached the ileo-caecal valve, it is the duty of that sphincter only to allow water, soluble material, and very small pieces of indigestible débris to enter the caecum. There are similarities in the physiologies—that is, homologies—between the pylorus and the ileo-caecal valve. The former is the portal between fragmentation on one hand, and chemical digestion on the other; the latter stands between chemical digestion and specialized absorption on the one hand, and possibly excretion and the absorption of water on the other. The stomach prepares food for the small intestine, the caecum for the large.

Fluid or semi-fluid material is passed from the small intestine through the ileo-caecal valve into the caecum. The latter is not adapted for the carriage of fluid by peristalsis; it is too large and thin-walled to contract efficiently unless it is tightly distended like the bulb of a Higginson's syringe. In addition, in man gravity works against it. As a result, the faeces must remain in the caecum until the absorption of water from them and the addition of mucus have rendered them of the proper consistency for their transit along the large intestine. Hence it is easy to understand why the caecum is so often the most capacious part of the large bowel, and why at operations, particularly for intestinal obstruction, surgeons so frequently find it distended out of all proportion to the rest of the alimentary canal, the bowels being full of fluid.

Hence, just as there is a natural pause for food in the stomach, so is there another for the products of digestion in the caecum; and in both the contents are prepared for their course in the succeeding part of the alimentary tract. To turn to the pathological significance of this halt, pause, or rest, it will be seen at once that the caecum is the breeding ground for bacteria *par excellence* of all parts of our intestine. The enumerations of the colonies from different parts of the alimentary tract bear this out, and have proved that colonies of bacteria are more frequent by hundreds and thousands here than in any part of the intestinal tract, even after a period of starvation. And it is only to be expected that this difference will show manifold increase when food is taken. It is now very easy to understand why Nature has established so large a storehouse of lymphoid tissue in the ileo-caecal region—to furnish leucocytes and protect the body from the bacteria, to which region the appendix is an intestinal "tonsil," an index of the fermentative processes which are going on within the caecum, a culture tube for the bacteria therein contained. Hence the very great frequency of its inflammation—appendicitis.

It will now be seen that there is strife between the micro-organisms and lymphoid tissue in the caecum of every living being. Hence the gradual disappearance of the lymphoid tissue as age advances. If the strife becomes a little more severe than it is ordinarily in health some inflammation about the ileo-caecal region will result, such as after a dietetic indiscretion. In the very great majority of cases this inflammation in the ileo-cacal region shows itself as appendicitis. In consequence, appendicitis may be regarded as a result of an exaggeration of the fermentative processes natural to the ileo-caecal regions of all.

The Physiology of the Appendix.

It has long been taught that this organ was functionless, and that most probably in this lay its apparent incapability to resist the attacks of disease. That it represents the terminal portion of the caecum, which has become differentiated in development, is undeniable. But that it is functionless is undoubtedly untrue. Like the rest of the intestinal mucous membrane, that of the appendix has numerous glands, whose secretion has apparently an insignificant digestive action on all foods. As little, if any, contents of the caecum ever enter the appendix, any digestive action it has must be of the smallest, whilst its absorption of products of digestion cannot be greater.

To sum up this phase of intestinal physiology: In the small intestine the products of digestion are fluid, and are being continuously passed onwards by peristalsis; the caecum is the first great "resting place" for these products since they have left the stomach; the large intestine, as its name implies, is of greater calibre than the small, and is more suited for the carriage by peristalsis of solid than of liquid faeces; the caecum being rendered less mobile owing to its peritoneal attachments and, in man, having to work semifluid material against gravity, the products of digestion have to remain in it until their consistence has become such as allows of their easy passage along the large intestine; the change in consistence is made by the deposition of mucus from the glands of the large intestine and the absorption of water. In consequence, the caecum of the child loses its tapering form, and becomes larger by the formation of pouches between the taeniae muscularis. During this pause further quantities of digested material will be deposited in the caecum and dilate that structure, possibly delaying the dispatch of the first "faecal" contribution. Hand in hand with these processes will go the fermentative changes of myriads of micro-organisms, to whom the temporary stagnation offers opportunity of multiplication. Hence the far greater quantity of bacteria in the large than in the small intestine. The temporary delay in the passage of the intestinal contents, the absence of a secretion like that of the stomach, the presence of large quantities of active micro-organisms and their products, point to the necessity for the development of a protective armament on the part of the host to counteract them. Hence the large development of lymphoid tissue in the terminal and most dependent part of the caecum, that is, the appendix, and its specialization, not degeneration. The need of the presence of this "intestinal tonsil" is apparent in the caecal region. The comparative absence of lymphoid tissue in the rest of the large intestine is explicable, as it is in the caecum that the faeces should have been brought up to the proper consistence to allow of their passage along the colon, and in consequence there should be no more considerable periods of "rest"; and as the faeces become dryer and harder, there will be less fermentative action.

Hence it may be said that:

(*a*) Lymphoid tissue is the characteristic feature of the caecal apex. The vermiform appendix of man is represented in the vertebrate kingdom by a mass of lymphoid tissue, situated most frequently at the caecal apex.

(*b*) As the vertebrate scale is ascended, this lymphoid tissue tends to be collected together into a specially differentiated portion of the intestinal canal, the vermiform appendix.

(*c*) The vermiform appendix of man is not, therefore, solely a vestigial structure, though it undoubtedly represents the terminal part of the caecum. On the contrary, it is a specialized part of the alimentary canal, Nature having made use of a disappearing structure and endowed it with a secondary function by giving it lymphoid tissue to protect the body against the micro-organisms in the ileo-caecal region.

Development and Life-History of the Appendix.

The development of this organ illustrates the previous contentions, and can be studied both in the individual—ontogeny—and in the animal series—phylogeny. That of the human fetus will be given first.

Up to the third month of intrauterine life the diverticulum of the primitive intestine, which subsequently becomes the caecum, is of uniform calibre throughout. At this period its growth becomes unequal, the terminal portion failing to increase in size at the same rate as the proximal. The inequality thus established becomes more and more marked as time goes on. At birth the terminal part of the caecum, or the appendix as it is called, forms a tapering prolongation of the caecal diverticulum.[2] It is not until later that a definite line of demarcation is to be seen between the two structures. The fetal type of caecum is, therefore, an inverted cone whose apex imperceptibly shades off into a prolongation of the

appendix.[3] It will now be seen that the appendix represents the terminal portion of the original caecum.

Turning to the animal series for suggestions to aid in the explanation of this phenomenon, it is found that a distinct appendix is only seen in man, anthropoid apes, lemurs, and the opossum. On the other hand, it is common to find a lymphoid structure at the distal portion of the caecum, which undoubtedly represents the appendix.[4] In the latter series of examples the caecum and its lymphoid appendage conform to the human fetal type. It is quite a later phase, both in ontogeny and phylogeny, that the caecum loses its conical form by the development of pouches between its three thin muscular bands. And it is by that the appendix becomes distinctly separated.

As age advances the appendix undergoes changes both in position and structure. In the fetus it is situated along with the caecum under the liver, and later it descends into the iliac fossa. Sometimes it remains in its fetal position, or it may be arrested at any part of its descent. An examination of the appendices for different decades shows that they are both relatively and absolutely longest and thickest between the ages of 10 and 30. The walls during this same period are packed with lymphoid nodules. After the latter age the appendix begins to undergo a slow involution both in length and thickness. The lymphoid nodules disappear also, though more slowly and uncertainly.

Robert Morris[5] has directed attention to the association of pain, intestinal and general symptoms with this involution. The change is certainly of a chronic inflammatory character, such as would be expected to occur in nearly every one who has an appendix, and is the result of the continued irritative action of bacteria throughout years. Still more recently Sir Berkeley Moynihan and Mr. Paterson have redirected attention to the occurrence of appendix dyspepsia, its more modern name.

The situation of the appendix in the pelvis is an acquired feature, associated with intestinal dyspepsia, constipation, pregnancy, visceroptosis, etc.

Pathology of Chronic Typhlitis and Appendicitis.

It is a matter of more or less common knowledge in the profession that, as years pass by, changes are found in the appendices of people who have never had a clinically recognizable attack of appendicitis. How much these changes are physiological it is impossible to decide, and it is not very important, because, whatever they are, they will interfere with the normal performance of the work of the appendix, and so lead to evil results. One of the best known of the changes is the disappearance of the lymphoid follicles that are so plentiful in early life. Is this disappearance pathological or physiological. Yet if sections are cut of appendices removed from people over 60, or even older, these follicles sometimes can be found in abundance. The persistence in these cases may be due to individual variations in the rate of ageing, or perhaps more probably they indicate that the disappearance is of more pathological than physiological import.

In considering the physiology of the appendix, it has been shown that the caecum is the first great place of rest, pause, or stasis for the products of digestion after they have left the stomach, and, as a result, the appendix, serving as an index to the chemical and bacteriological processes which occur there, is well supplied with lymphoid tissue. One well-known property of lymphoid tissue is that by producing leucocytes it is actively protective to its possessor against foreign invaders. Situated in a blind tube in whose lumen are represented types of the organisms inhabiting the large bowel and their fermentations, the lymphoid follicles must have a great deal of work to do, more even than the tonsils, to which the appendix has been likened. It is well-known that the tonsils undergo fibrosis or chronic inflammation without the occurrence of an acute attack. In a like manner do similar changes occur in the appendix, but unfortunately there is a very marked difference. Fibrosis of the appendix interferes with the efficiency of its peristaltic action and the tube becomes incapable of emptying itself. By these means a vicious circle is established; the more pabulum which remains the more will bacteria flourish, and the more likely is it that the chronic inflammation will progress, and the organ become still more incapable of performing its own evacuation. Such a condition may be aptly called appendicular constipation. The inspissation of the contents will lead to the formation of an appendicular calculus or faecal concretion, which may be likened to scybala elsewhere in the large intestine. It may be assumed that the presence of concretions indicates the existence of pathological change. And their association with chronic inflammation explains the fact that they are frequently found by the surgeon and the pathologist in cases which have never had a clinically recognized attack of appendicitis.

The results of chronic appendicitis may be at times far more extensive than this. The fibrosis, with its subsequent contraction, leads to further disappearance of the lymphoid follicles and impairment of the muscular action. The appendix consequently becomes an inert breeding ground for micro-organisms, and if they escape into the caecum the multiplication is continued there. The caecum will be affected sooner or later by the continued escape into it of toxic material elaborated in the appendix, and as it is necessary that the products of digestion remain there until they are of suitable consistencey to be passed on into the ascending colon, those toxic materials will become still further elaborated and give rise to chronic typhlitis. Again there is the vicious circle, as the inflammatory condition will impair the contractile power of the caecum, and so lead to further bacterial growth and further chronic inflammation. In this way a colitis may be established throughout the entire length of the large bowel.

Our life-history as regards the micro-organisms in our intestines is of interest. Before birth the meconium in our bowel is sterile. With the first taking of its food the baby is introduced to their action and begins a lifelong education from his alimentary tract. In this connexion it is of great importance to note that the frequency of appendicitis is greatest between the ages of 10 to 20, the decade of the first habitual excesses in human life. After 30 years of age the lymphoid follicles are disappearing and the patient is becoming immune; but, should appendicitis occur after 30, the suppurative complications, abscess and peritonitis, are more frequent than they are at earlier ages. Indeed, in the fifth and sixth decades of life appendicitis with obvious suppuration is more common than appendicitis without obvious suppuration.[6]

REFERENCES.

[1] *Clinical and Pathological Observations in Acute Abdominal Disease* (Constable and Co.), 1904. [2] Keith, *Human Development and Morphology*. [3] Battle and Corner, *Surgery of the Appendix*, Fig. 2, A, p. 28. [4] Berry, *Journ of Anat. and Phys.*, 1901. [5] Morris, *Amer. Journ. of Obstet. and Gynaec.*, 1901, p. 439. [6] *Surgery of the Appendix* (Constable and Co.). p. 33.

THE report presented to the annual meeting of the Women's Imperial Health Association, held at its office at 7, Hanover Square, stated that schools for mothers had been started in Lambeth, North Kensington, and Tottenham, and that a juvenile health crusade was enlisting children. The caravan tours, which had proved successful in the past, had been continued. During the year Sussex had been visited and certain places in Kent and Surrey. The London parks caravan worked during the summer at Battersea Park, Clapham Common, Wandsworth Common, and Tooting Common. During the year no fewer than 310 lectures had been delivered under the auspices of the association, many of them illustrated by lantern slides and cinematograph films.

IN response to the wish of the Dresden branch, a general meeting of the Deutsche Gesellschaft zur Bekämpfung des Kurpfuschertums (German Society for the Suppression of Quackery) decided on January 18th, 1913, to remove its headquarters to Dresden. Dr. Seifart, the first chairman, who has carried out his onerous duties for upwards of ten years, has repeatedly intimated his wish to resign, and during the last few months has pressed the Executive Committee to accept his resignation. The Executive paid a warm tribute to the untiring work of the chairman. It regretfully accepted his resignation. A new Executive Committee, consisting of Wirkl. Geh.-Rat Exzellenz Professor Dr. Fiedler, Geheimrat Professor Dr. Schmorl, Professor Beythien, Medizinalrat Thiersch, and others, has been elected. Dr. Neustätter (of Dresden-Hellerau) has been elected Provisional Chairman and Business Manager, to whom all communications, inquiries, etc., concerning the German Society for the Suppression of Quackery should be addressed.